EXHIBIT G

Robert Wright

EDCS-765200

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Agenda

- Team members
- Problem that we needed to solve
- Cost of solving the problem 100% manually
- Solution
- Components of the solution
- Results from SDCD phase 1
- Other CICV Features
- What's next?

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SDCD

- Team Members

Robert Wright
PM
SDCD concept development

Bob Monsen
PCA Development

Mark Novembrino
SDCD code development

Atul Patil
PCA Development

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PCA Development

Sastry Varanasi
PCA Development

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Problem that we Needed to Solve

- Documentation is missing syntax

show arap

To display information about a running AppleTalk Remote Access Protocol (ARAP) connection, use the **show arap** command in EXEC mode.

show arap [*line-number*]

Syntax Description

line-number	(Optional) Number of the line on which an ARAP connection is established and active.

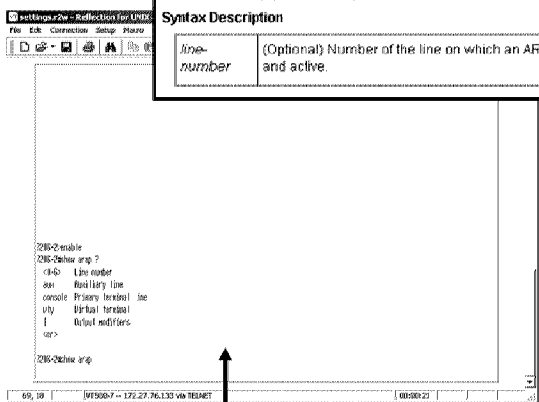Extract from the show arap command documentation in the *Cisco IOS Terminal Services Command Reference, Release 12.4T*

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Problem that we Needed to Solve

- Documentation is missing syntax

show arap

To display information about a running AppleTalk Remote Access Protocol (ARAP) connection, use the **show arap** command in EXEC mode.

show arap [*line-number*]

Syntax Description

line-number	(Optional) Number of the line on which an ARAP connection is established and active.

CLI session with a Cisco 7200 series router in the KMD Documentation Lab – entering the show arap ? command

Problem that we Needed to Solve

- Documentation is missing syntax

show arap

To display information about a running AppleTalk Remote Access Protocol (ARAP) connection, use the **show arap** command in EXEC mode.

show arap [*line-number*]

Syntax Description

line-number	(Optional) Number of the line on which an ARAP connection is established and active.

```
7206-2# show arap ?
  <0-6>    Line number
  aux      Auxiliary line
  console  Primary terminal line
  vty      Virtual terminal
  |        Output modifiers
  <cr>
```

CLI session with a Cisco 7200 series router running Cisco IOS 12.4(22)T in the KMD Documentation Lab – entering the show arap ? command

Problem that we Needed to Solve

- Documentation is missing syntax

show arap

To display information about a running AppleTalk Remote Access Protocol (ARAP) connection, use the **show arap** command in EXEC mode.

show arap [*line-number*]

Syntax Description

line-number	(Optional) Number of the line on which an ARAP connection is established and active.

```
7206-2# show arap ?
  <0-6>    Line number
  aux      Auxiliary line
  console  Primary terminal line
  vty      Virtual terminal
  |        Output modifiers
  <cr>
```

The documentation indicates that the show arap command has only one argument – the Cisco IOS 12.4(24)T image on the router shows that there are additional keywords for this command

Problem that we Needed to Solve

- Historical causes of documentation missing syntax

  Documentation groups are not notified when code changes are made

  Limited access to networking devices to verify the CLI syntax while writing the documentation

  Lack of training in performing CLI syntax verification on networking devices

Problem that we Needed to Solve

- Mitigation of the historical causes of documentation missing syntax

    Documentation groups are not notified when code changes are made – Behavior Change Notification Program (EDCS-730050)

    Limited access to networking devices to verify the CLI while writing the documentation – Comprehensive KMD Lab Facilities Now Available (EDCS-593075)

    Lack of training in performing CLI syntax verification on networking devices – CLI Verification Training Now Available (EDCS-628298)

A thorough discussion of the mitigations listed here is beyond the scope of this presentation – please refer to the documents in EDCS listed above

Contact rwright@cisco.com if you cannot access these documents

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Problem that we Needed to Solve

- Still need to find CLI syntax errors in the documentation that existed prior to the mitigations noted on the previous slide

- Still need to find CLI syntax errors in the documentation that are not prevented by the mitigations noted on the previous slide

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Agenda

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Cost of Solving the Problem 100% Manually

- At the time the SDCD project was started there were approximately 14K* Cisco IOS commands documented in the documentation database

- A pilot of performing 100% manual verification of the Cisco IOS commands in the documentation database estimated the cost of manual CLI syntax verification to be approximately one million dollars

*There are now over 16K commands documented in the documentation database.

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Solution

- Create a tool that can systematically identify syntax errors in the on-line documentation (Command References) for Cisco IOS commands

  Saves the time that would have been spent doing manual verification on commands that are found not to have errors

  Still have to manually verify commands that are found to have errors because the tool only finds some of the possible problems with the commands

Solution

The Command Doc Quality Analysis – CRs feature does a comparison of the commands in a PCA report with the documented syntax for commands in the Cisco IOS command references

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Solution

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Solution

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Solution

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Solution

- CICV error report

	A	B	Syntax Analysis
1	CISCV Error Status	Command	Syntax Analysis
53	Command has errors	show arap	show arap tty <number>
54			show arap aux <number>
55			show arap console <number>
56			show arap vty <number>
57			
58	Command is not documented	show archive config rollback commands	show archive config rollback commands <text-s
59			show archive config rollback commands <text-s
60			

show arap command is found to have errors

Agenda

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Components of the solution

- Cisco Command Validation Tool (CICV)

- Parse chain analyzer (PCA)

- Cisco IOS Master Command Lists (MCL)

- Cisco IOS Command References (CR)

Components of the solution

- CICV Tool

The CICV tool is coded in JAVA and runs on a UNIX server

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Components of the solution

- PCA

    A tool owned by the Infrastructure TC-Embedded Management Engineering group

    Analyzes Cisco IOS source code and other data sources

    Outputs CLI syntax and other data

    PCA Site

    http://wiki-eng.cisco.com/engwiki/PCA_20_28Parse_20Chain_20Analyzer_29

    The CICV tool uses only the PCA CLI syntax reports

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Components of the solution

- Cisco IOS MCLs

    Complete on-line lists of the documentation for the commands in a Cisco IOS release – for example, 12.4T

    The commands that are listed in the MCLs are hyper-linked to the documentation for the commands in their respective CRs

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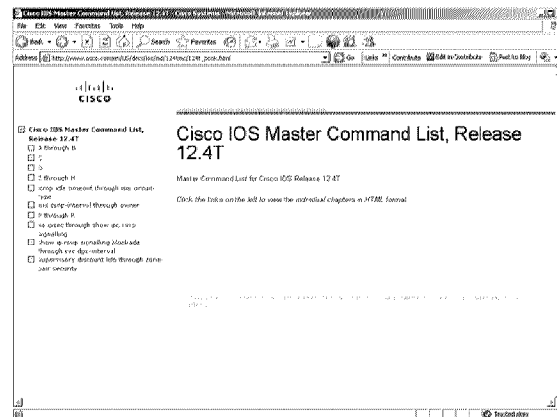
Components of the solution

- ## Cisco IOS CRs

    Syntax, usage guidelines and examples for Cisco IOS
    commands for a specific technology area – for example,
    Terminal Services

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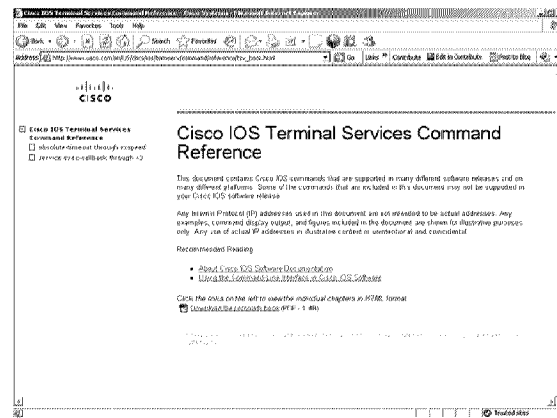
Components of the solution

- Cisco IOS MCLs & CRs

    The commands listed in the MCL are hyperlinked to the documentation for the command in the CR

    show appletalk zone ATK-179
    show aps IR-694
    show arap TSV-128
    show archive CF-556, HA-411
    show archive config differences CF-558
    show archive config incremental-diffs CF-560
    show archive log config CF-562

    Extract from the MCL

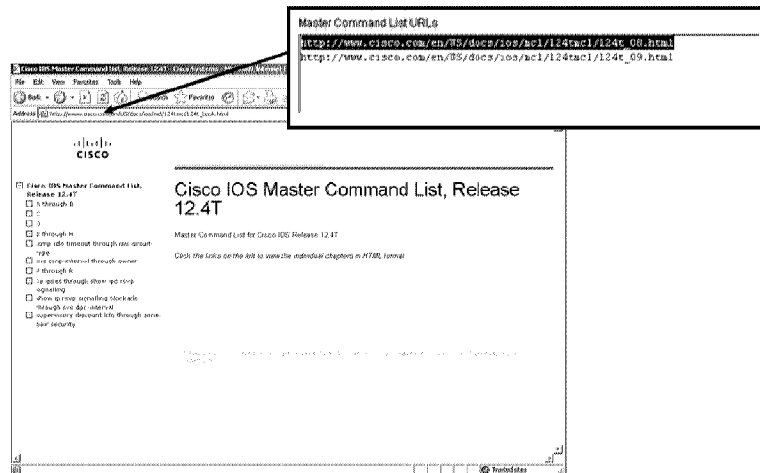SDCD   © 2009 Cisco Systems, Inc. All rights reserved.   Cisco Confidential   29

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Components of the solution

- Cisco IOS MCLs

MCL data entry section of the CICV tool

Master Command List URLs

http://www.cisco.com/en/US/docs/ios/mcl/124tmcl/124t_08.html
http://www.cisco.com/en/US/docs/ios/mcl/124tmcl/124t_09.html

Cisco IOS Master Command List, Release 12.4T

Master Command List for Cisco IOS Release 12.4T

Click the links on the left to view the individual chapters in HTML format

The CICV tool reads in the MCL HTML code from the URL and starts analyzing it to find the links to the documentation for each command – this all happens behind the scenes, the web page is shown here to help you visualize the process
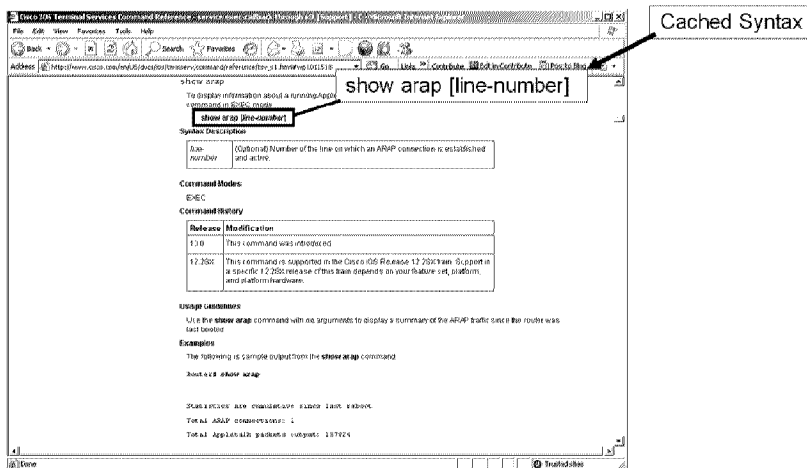
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Components of the solution

- Cisco IOS command documentation

When the CICV tool finds the documentation for a command, it caches the text for the syntax from the HTML code – this all happens behind the scenes, the web page is shown here to help you visualize the process

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Components of the solution

- **PCA data**

Partial extract from PCA data file – c7200p-adventerprisek9-mz-exec.dump from 12.4(24)T

```
<tokens>
<id>show_arap</id>
<index>3</index>
<type>KW</type>
<token>arap</token>
<macro>KEYWORD</macro>
</tokens>
<action>
<name>show_arap_eol</name>
<chainFileDir>/vob/ios/sys/arap</chainFileDir>
<chainFile>ara_chain.c</chainFile>
<configFile>exec_show_arap.h</configFile>
<func>show_arap</func>
<line>45</line>
<macro>EOLNS</macro>
<cExpr>{ara_chain.c-exec_show_arap.h:46(csb-&#38;#62;val1=0xFFFFFFFFL)}</cExpr>
</action>
<cmdText>show arap</cmdText>
</CommandContext>
<CommandContext>
<tokens>
<id>exec_show</id>
<index>2</index>
<type>KW</type>
<token>show</token>
<macro>KEYWORD</macro>
</tokens>
```

Components of the solution

- CICV error report – cached CLI syntax compared with PCA data

	A	B	Syntax Analysis
1	CISCV Error Status	Command	Syntax Analysis
53	Command has errors	show arap	show arap tty <number>
54			show arap aux <number>
55			show arap console <number>
56			show arap vty <number>
57			
58	Command is not documented	show archive config rollback commands	show archive config rollback commands <text-s
59			show archive config rollback commands <text-s
60			

show arap command is found to have errors – it has undocumented keywords

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Results from SDCD Phase 1

- Focused on **show** commands in 12.4(22)T

- Identified 438 undocumented **show** commands

- Identified 168 **show** commands for which the documentation is missing syntax

- Opened 549 doc bugs

Some of the errors were found in the documentation of older content that is no longer maintained

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Results from SDCD Phase 1

- Total number of **show** commands with errors – 606

- If the number of undocumented **show** commands is added to the number of documented **show** commands, there should have been 2797 commands documented in the database

- 21% of the **show** commands are either undocumented, or documented with errors

Agenda

- Team members
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Other CICV Features

- Command Doc Quality Analysis – MCLs

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Other CICV Features

- Command Doc Quality Analysis – MCLs

    Compares the commands listed in the MCLs with a list of commands in the database to identify commands that have documentation, but the documentation is not appearing in the on-line documentation

    In SDCD phase 1 there were 28 **show** commands in the database that did not appear in the 12.4T MCL

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Other CICV Features

- Compare Releases

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Other CICV Features

- Compare Releases

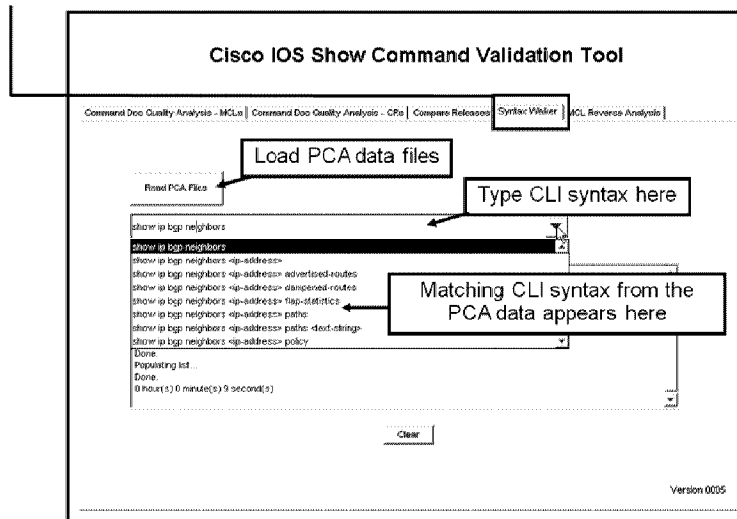   Compares the command CLI syntax in the PCA data from any two Cisco IOS releases and reports the differences

Other CICV Features

- Syntax Walker

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Other CICV Features

- MCL Reverse Analysis

Other CICV Features

- MCL Reverse Analysis

    Used to compare the commands listed in a MCL for a release with the commands in a PCA report for the release to identify commands that are listed in the MCL when the command is not supported in the release

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What's Next

- Add support for Cisco IOS releases other than 12.4T to the PCA tool

    Right now there is no funding for PCA improvements

What's Next

- Automatic CLI verification for Configuration Documentation

  Extracts CLI syntax from tasks and configuration examples in configuration guides and features modules

  Sends the CLI syntax to an appropriate networking device to verify the CLI syntax is supported and reports errors

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